CLAIMS

We Claim:

~~1. A viral immunogen derived from a mammalian virus and expressed in a plant.~~

2. The immunogen of claim 1 wherein at least a portion of said plant is edible.

3. The immunogen of claim 1 wherein said immunogen is a mucosal immunogen.

4. The immunogen of claim 3 wherein the mucosal immunogen is capable of binding a glycosylated molecule on the surface of a membrane of a mucosal cell.

5. The immunogen of claim 1 wherein said immunogen is a chimeric protein.

6. The immunogen of claim 1 wherein said immunogen is an immunogen derived from a hepatitis virus.

7. A viral mucosal immunogen derived from a hepatitis virus, wherein said immunogen is expressed in a plant, wherein said immunogen is capable of binding a glycosylated molecule on a surface of a membrane of a mucosal cell.

8. A transgenic plant comprising a plant expressing a recombinant viral immunogen derived from a mammalian virus.

9. The transgenic plant of claim 8 wherein said plant is edible.

10. The transgenic plant of claim 8 wherein said immunogen is a mucosal immunogen.

11. The transgenic plant of claim 8 wherein the mucosal immunogen is capable of binding a glycosylated molecule on the surface of a membrane of a mucosal cell.

12. The transgenic plant of claim 8 wherein said immunogen is a chimeric protein.

13. The transgenic plant of claim 8 wherein said immunogen is an immunogen derived from a hepatitis virus.

14. A transgenic plant expressing a recombinant viral mucosal immunogen of hepatitis virus, wherein said mucosal immunogen is capable of binding a glycosylated molecule on a surface of a membrane of a mucosal cell.

15. A vaccine comprising a recombinant viral immunogen expressed in a plant.

16. The vaccine of claim 15 wherein said immunogen is a mucosal immunogen.

17. The vaccine of claim 15 wherein the mucosal immunogen is capable of binding a glycosylated molecule on the surface of a membrane of a mucosal cell.

18. The vaccine of claim 14 wherein said immunogen is a chimeric protein.

19. The vaccine of claim 14 wherein said immunogen is an immunogen derived from a hepatitis virus.

20. A vaccine comprising a mucosal immunogen of hepatitis virus expressed in a plant, wherein said mucosal immunogen is capable of binding a glycosylated molecule on a surface of a membrane of a mucosal cell.

21. A food comprising at least a portion of a transgenic plant capable of being ingested for its nutritional value, said plant comprising a plant expressing a recombinant viral immunogen.

22. The food of claim 21 wherein said immunogen is a mucosal immunogen.

23. The food of claim 21 wherein the mucosal immunogen is capable of binding a glycosylated molecule on the surface of a membrane of a mucosal cell.

24. The food of claim 21 wherein said immunogen is a chimeric protein.

25. The food of claim 21 wherein said immunogen is an immunogen derived from a hepatitis virus.

26. A food comprising at least a portion of a transgenic plant capable of being ingested for its nutritional value, said plant expressing a recombinant viral mucosal immunogen of hepatitis virus, wherein said mucosal immunogen is capable of binding a glycosylated molecule on a surface of a membrane of a mucosal cell.

27. The food of any of claims 21-26 wherein said plant portion includes the fruit, leaves, stems, roots, or seeds of said plant.

28. A plasmid vector for transforming a plant comprising:

a DNA sequence encoding a viral immunogen; and

a plant-functional promoter operably linked to said DNA sequence capable of directing the expression of said immunogen in said plant.

29. The plasmid vector of claim 28 further comprising a selectable or scorable marker gene.

30. The plasmid vector of claim 28 wherein said plant promoter comprises CaMV35S.

31. The plasmid vector of claim 28 wherein said plant is edible.

32. The plasmid vector of claim 28 wherein said immunogen is a mucosal immunogen.

33. The plasmid vector of claim 28 wherein the mucosal immunogen is capable of binding a glycosylated molecule on the surface of a membrane of a mucosal cell.

34. The plasmid vector of claim 28 wherein said immunogen is a chimeric protein.

35. The plasmid vector of claim 28 wherein said immunogen is an immunogen derived from a hepatitis virus.

36. A plasmid vector for transforming a plant comprising:

a DNA sequence encoding a mucosal immunogen of hepatitis virus, said mucosal immunogen capable of binding a glycosylated molecule on a surface of a membrane of a mucosal cell; and

a plant-functional promoter operably linked to said DNA sequence capable of directing the expression of said immunogen in said plant.

37. A DNA fragment useful for microparticle bombardment transformation of a plant comprising:

a DNA sequence encoding a viral immunogen; and

a plant-functional promoter operably linked to said DNA sequence capable of directing the expression of said immunogen in said plant.

38. The DNA fragment of claim 37 further comprising a selectable or scorable marker gene.

39. The DNA fragment of claim 37 wherein said plant promoter comprises CaMV35S.

40. The DNA fragment of claim 37 wherein said plant is edible.

41. The DNA fragment of claim 37 wherein said immunogen is a mucosal immunogen.

42. The DNA fragment of claim 37 wherein the mucosal immunogen is capable of binding a glycosylated molecule on the surface of a membrane of a mucosal cell.

43. The DNA fragment of claim 37 wherein said immunogen is a chimeric protein.

44. The DNA fragment of claim 37 wherein said immunogen is an immunogen derived from a hepatitis virus.

45. A DNA fragment for ballistically transforming a plant comprising:

a DNA sequence encoding a mucosal immunogen of hepatitis virus, said mucosal immunogen capable of binding a glycosylated molecule on a surface of a membrane of a mucosal cell; and

a plant-functional promoter operably linked to said DNA sequence capable of directing the expression of said immunogen in said plant.

46. A method for constructing a transgenic plant cell comprising the steps of:

constructing a plasmid vector or a DNA fragment by operably linking a DNA sequence encoding a viral immunogen to a plant-functional promoter capable of directing the expression of said immunogen in said plant; and

transforming a plant cell with said plasmid vector or DNA fragment.

47. The method of claim 46 further comprising the step of;

regenerating a transgenic plant from said transgenic plant cell.

48. A method for producing a vaccine comprising the steps of:

constructing a plasmid vector or a DNA fragment by operably linking a DNA sequence encoding a viral immunogen to a plant-functional promoter capable of directing the expression of said immunogen in said plant;

transforming a plant cell with said plasmid vector or DNA fragment; and

recovering said immunogen expressed in said plant cell for use as a vaccine.

49. The method of claim 48 further comprising the step of;

prior to recovering said immunogen for use as a vaccine, regenerating a transgenic plant from said transgenic plant cell.

50. The method of claim 48 wherein said recovery step further comprises obtaining an extract of said plant cell.

51. The method of claim 49 wherein said recovery step further comprises harvesting at least a portion of said transgenic plant.

52. The method of claim 48 wherein said plant cell is transformed utilizing an Agrobacterium system.

53. The method of claim 52 wherein said Agrobacterium system is an Agrobacterium tumefaciens-Ti plasmid system.

54. The method of claim 48 wherein said plant cell is transformed utilizing a microparticle bombardment transformation system.

55. The method of claim 48 wherein said DNA sequence is a DNA sequence encoding a hepatitis virus immunogen.

56. The method of claim 48 wherein said plant is a tomato plant.

57. The method of claim 48 wherein said plant is a tobacco plant.

58. The method of claim 48 wherein said plasmid vector is a binary vector.

59. The method of claim 48 wherein said plasmid vector is an integrative vector.

60. The method of claim 48 wherein said plasmid vector is pB121.

61. The method of claim 48 wherein said plant cell is transformed by microinjection.

62. The method of claim 48 wherein said plant cell is transformed by polyethylene glycol mediated uptake.

63. The method of claim 48 wherein said plant cell is transformed by electroporation.

64. The method of claim 48 wherein said plant cell is transformed by microparticle bombardment.

65. The method of claim 48 wherein said plant cell is a cell of a dicotyledon.

66. The method of claim 48 wherein said plant cell is a cell of a monocotyledon.

67. A method of administering any of the vaccines of claims 15-20 comprising administering a therapeutic amount of said vaccine to a mammal.

68. The method of claim 67 wherein the administering of a vaccine further comprises a parenteral introduction of said vaccine into said mammal.

69. The method of claim 67 wherein the administering of a vaccine further comprises a non-parenteral introduction of said vaccine into said mammal.

70. The method of claim 69 wherein said non-parenteral introduction of said vaccine into said mammal further comprises an oral introduction of said vaccine into said mammal.

71. A method of administering an edible portion of a transgenic plant, which transgenic plant expresses a recombinant viral immunogen, to a mammal as an oral vaccine against a virus from which said immunogen is derived, comprising:

harvesting at least an edible portion of said transgenic plant; and

feeding said harvested portion of said transgenic plant to a mammal in a suitable amount to be therapeutically effective as an oral vaccine in the mammal.

72. A method of producing and administering an oral vaccine, comprising the steps of:

constructing a plasmid vector or DNA fragment by operably linking a DNA sequence encoding a viral immunogen to a plant-functional promoter capable of directing the expression of said immunogen in a plant;

transferring the plasmid vector into a plant cell;

regenerating a transgenic plant from said cells;

harvesting an edible portion of said regenerated transgenic plants; and

feeding said edible portion of said plant to a mammal in a suitable amount to be therapeutically effective as an oral vaccine.